SV300

Ventilator

Operator’s Manual

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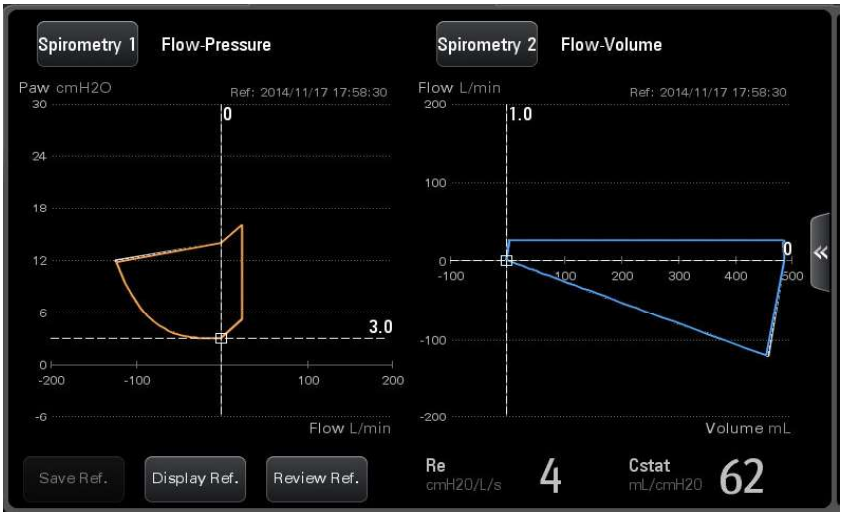
CE 0123

For this Operator’s Manual, the issue date is September, 2020.

The screen as shown below is displayed by pressing the  button.



4.6.4 Exit freeze status

In freeze status, press the [**Freeze**] key to exit freeze status. In freeze status, if no operation is performed on the ventilator for more than three (3) minutes, the system exits freeze status automatically.

4.7 Lock Screen

Press the  soft key on the main screen to enter locked status, and the [**Screen locked. Press the Lock key to unlock screen.**] prompt message is displayed. During the period of screen locked, only  , O_2↑ Suction, and  key are enabled. Touch screen, control knob, and other keys are disabled. Press this key a second time to unlock the screen.

6 Ventilation

6.1 Turn on the System

1. Insert the power cord into the power receptacle. Ensure the external power indicator light is lit.
2. Press the ⊙/Ȯ key.
3. The alarm indicator light flashes yellow and red once in turn, and then the speaker and the buzzer give a check sound respectively.
4. A start-up screen and start-up check progress bar appear. Then the System Check screen is displayed.

NOTE

- **When the ventilator is started, the system detects whether audible alarm tones and alarm lamp function normally. If yes, the alarm lamp flashes red and yellow successively, and the speaker and the buzzer give check tones. If not, do not use the equipment and contact us immediately.**

6.2 System Check

⚠WARNING

- **To ensure optimum performance of the ventilator, re-do System Check each time after changing the patient type, replacing the accessories or components like patient tubing, humidifier, and filter.**

⚠CAUTION

- **Always run System Check before using the ventilator on a patient. If the ventilator fails any tests, remove it from clinical use. Do not use the ventilator until necessary repairs are completed and all tests have passed.**
- **Before running System Check, disconnect the patient from the equipment and ensure that a backup ventilation mode is available for patient ventilation.**

To enter the System Check screen,

- The System Check screen is accessed automatically after powering on the system.
- On the non-standby screen, select the [**Standby**] button and enter the Standby status after your confirmation. Select the [**System Check**] button in the Standby status to enter the System Check screen.

The system check screen displays the last system check time. Select the [**Details**] button to query the system check information of the ventilator system, including system check items, System Check results, and System Check time.

Connect the gas supply and block the Y piece as illustrated. Then select [**Continue**] to start System Check item by item.

System Check items include:

- Blower test: test the speed of the turbine blower.
- O_2 flow sensor test: test the flow sensor in O_2 limb.
- Inspiratory flow sensor test: test the inspiration valve and flow sensor.
- Expiratory flow sensor test: test the expiratory flow sensor.
- Pressure sensor test: test the pressure sensors at the inspiratory and expiratory ports.
- Expiration valve test
- Safety valve test
- Leakage (mL/min)
- Compliance (mL/cmH_2O)
- Tube resistance (cmH_2O/L/s)
- O_2 sensor test

System Check result can be:

- Pass: indicates that check of this item is completed and is passed;
- Fail: indicates that check of this item is completed but is failed;
- Cancel: indicates that check of this item is cancelled;
- O_2 Supply Failure: indicates that O_2 supply is insufficient when O_2 sensor test or O_2 flow sensor test is being carried out;
- Monitoring Off: indicates that sensor monitoring function may not be switched on when O_2 sensor test is being carried out.

NOTE

- **Nebulization is disabled in V-A/C, V-SIMV, PRVC-SIMV, AMV and PRVC modes when patient type is pediatric.**
- **When O_2 supply type is low-pressure, pressing the [Nebulizer] key will not activate nebulizer, rather display the prompt message [Fail to Start with Low Pressure O_2 Supply].**
- **Aerosolized medication may occlude the expiration valve and flow sensor. Please have them checked and cleaned after nebulization.**
- **Nebulization may cause fluctuation in the patient's FiO_2.**
- **The ventilator switches off the nebulizer flow when the inspiratory flow is less than 15 L/min.**

9.5 O_2 ↑ (O_2 enrichment)

O_2 ↑ is also called as O_2 enrichment. It means to deliver oxygen with concentration higher than normal level within the specified time period. In the adult patient group, the O_2 enrichment function delivers 100 % oxygen. In the pediatric patient group, the O_2 enrichment function delivers 1.25 times of the current oxygen concentration or 100 %, whichever is less.

Press the [**O_2 ↑ Suction**] key and the ventilator starts oxygen enrichment. The indicator light for [**O_2 ↑ Suction**] key is illuminated and the remaining oxygen enrichment time is displayed in the prompt message field. Oxygen enrichment is active for maximum two minutes. During oxygen enrichment, the currently set oxygen concentration is displayed in the [**O_2 %**] parameter setup quick key field.

When the 2-minute period of oxygen enrichment is up or the [**O_2 ↑ Suction**] key is pressed again, the ventilator terminates oxygen enrichment.

NOTE

- **O_2 ↑ (oxygen enrichment) is disabled in Standby status.**
- **When O_2 supply type is low-pressure, pressing the [O_2 ↑ Suction] key will not activate oxygen enrichment, rather display the prompt message [Fail to Start with Low Pressure O_2 Supply].**
- **Removing the patient tubing during oxygen enrichment will start suction function. Refer to section 9.6 Suction.**

Audio indicator	
Speaker	Gives off alarm tones and key tones; supports multi-level tone modulation. The alarm tones comply with the requirements of IEC60601-1-8.
Buzzer	Gives off auxiliary audio alarm in case of speaker malfunction.
Connector	
Network connector	A connector which supports connection with a PC to perform software upgrade and connection with external medical and information device.
RS-232 connector	Connects to the external calibration device for calibrating pressure. An external medical device can be connected via this connector to communicate with the ventilator.
USB connector	Exports captured screen, conducts ventilator software upgrade, configuration information export and history data (such as patient data, alarm log, calibration table) export, configuration transfer between machines of the same type via USB device.
Nurse call connector	Connects to the hospital's nurse call system.
VGA connector	Outputs VGA video signals with the same contents to the primary display and connects to the external display (supporting display with resolution of 1280*800).

B.5 Pneumatic System Specifications

NOTE

- **All gas volume, flow and leakage specification are expressed at STPD except those associated with the VBS which are expressed at BTPS.**

High-pressure oxygen inlet	
Gas type	O_2
Pressure range	280 to 600 kPa
Rated flow requirement	No less than 120 L/min (STPD)
Connector	NIST or DISS
Fresh gas	Fresh gas is called after supplied Air and O_2 are mixed.
Low-pressure oxygen inlet	
Pressure range	Less than 100 kPa
Maximum flow	15 L/min(STPD)
Connector	CPC quick connector
Inspiration module	
Peak flow in case of single supply gas(air)	≥210 L/min(BTPS)

D Alarm Messages

This chapter lists physiological and technical alarm messages.

Note that in this chapter:

- Column P stands for the default alarm level: H for high, M for medium and L for low.
- For each alarm message, corresponding actions are given instructing you to troubleshoot problems. If the problem persists, contact your service personnel.

D.1 Physiological Alarm Messages

Source	Alarm message	P	Cause and action
Ventilator parameters	Paw Too High	H	The airway pressure exceeds the set pressure high alarm limit.
			1. Check the patient. 2. Check the ventilation parameter setup. 3. Check the alarm limits. 4. Check the patient tubing for occlusion.
	FiO_2 Too High	H	The inspired O_2 concentration is greater than the FiO_2 high alarm limit for at least 30s.
			1. Check the ventilation parameter setup. 2. Check the alarm limits. 3. Check the HEPA filter for occlusion. 4. Calibrate the O_2 sensor.
	FiO_2 Too Low	H	The inspired O_2 concentration is less than the FiO_2 low alarm limit for at least 30s or is less than 18 %.
			1. Check the ventilation parameter setup. 2. Check the alarm limits. 3. Check the O_2 supply. 4. Calibrate the O_2 sensor.
	O_2% Too High	H	During O_2 therapy, the O_2 concentration is greater than the O_2% high alarm limit for at least 30s.
			1. Check the ventilation parameter setup. 2. Check the alarm limits. 3. Check the O_2 supply. 4. Calibrate the O_2 sensor.
	O_2% Too Low	H	During O_2 therapy, the O_2 concentration is less than the O_2% low alarm limit for at least 30s or is less than 18 %.
			1. Check the ventilation parameter setup. 2. Check the O_2 supply. 3. Calibrate the O_2 sensor.

	TVe Too High	M	The TVe monitored value is greater than TVe high alarm limit for continuous 3 mechanical ventilation cycles.
			1. Check the ventilation parameter setup. 2. Check the alarm limits.
	TVe Too Low	M	The TVe monitored value is less than TVe low alarm limit for continuous 3 mechanical ventilation cycles.
			1. Check the patient. 2. Check the ventilation parameter setup. 3. Check the alarm limits. 4. Check the patient tubing for leakage or occlusion. 5. Perform System Check to test the leakage.
	MV Too High	H	MV is greater than MV high alarm limit.
			1. Check the ventilation parameter setup. 2. Check the alarm limits.
	MV Too Low	H	MV is less than MV low alarm limit.
			1. Check the ventilation parameter setup. 2. Check the alarm limits. 3. Check the patient tubing for leakage or occlusion. 4. Perform System Check to test the leakage.
	Apnea	H	The time of failure to detect respiration exceeds Tapnea.
			1. Check the patient. 2. Manual breath. 3. Check apnea time setup. 4. Check if the patient tubing are disconnected.
	Apnea Ventilation	H	The time of failure to detect respiration exceeds Tapnea. Start apnea ventilation mode.
			Check apnea ventilation parameter setup.
	ftotal Too High	M	ftotal is greater than ftotal high alarm limit.
			1. Check the patient. 2. Check the ventilation parameter setup. 3. Check the alarm limits.
Main control board	Apnea Ventilation Ended	L	This alarm is given when apnea ventilation ends. There is no need to process this alarm.

CO_2 module	$EtCO_2$ Too High	M	The monitored parameter value exceeds the alarm limit.
			1. Check the patient type. 2. Check the alarm limits.
	$EtCO_2$ Too Low	M	The monitored parameter value exceeds the alarm limit.
			1. Check the patient type. 2. Check the alarm limits.
	Apnea CO_2	M	The time of failure to detect respiration by the CO_2 module exceeds Apnea Tinsp.
			1. Check the patient. 2. Check apnea time setup. 3. Check the connections of CO_2 module sampling device.
SpO_2 module	SpO_2 Too High	M	The monitored parameter value exceeds the alarm limit.
			Check the patient's physiological condition. Check if the patient type and the alarm limit settings are correct.
	SpO_2 Too Low	M	The monitored parameter value exceeds the alarm limit.
			Check the patient's physiological condition. Check if the patient type and the alarm limit settings are correct.
	SpO_2 Desat	H	The SpO_2 value falls below the desaturation alarm limit.
			Check the patient's condition and check if the alarm limit settings are correct.
	PR Too High	M	The monitored parameter value exceeds the alarm limit.
			Check the patient's physiological condition. Check if the patient type and the alarm limit settings are correct.
	PR Too Low	M	The monitored parameter value exceeds the alarm limit.
			Check the patient's physiological condition. Check if the patient type and the alarm limit settings are correct.
	No Pulse	H	The pulse signal was so weak that the monitor cannot perform pulse analysis.
			Check the patient's condition, SpO_2 sensor and measurement site.

D.2 Technical Alarm Messages

Source	Alarm message	P	Cause and action
Power board	Battery 1 Failure 01	H	The temperature of battery 1 is higher than expected.
			Contact your service personnel.
	Battery 1 Failure 02	H	Battery 1 Charge Failure
			Contact your service personnel.
	Battery 1 Failure 03	H	Battery 1 Aging
			Contact your service personnel.
	Battery 1 Failure 04	H	Battery 1 Comm Error
			Contact your service personnel.
	Battery 1 Failure 05	H	Battery 1 Failure
			Contact your service personnel.
	Battery 2 Failure 01	H	The temperature of battery 2 is higher than expected.
			Contact your service personnel.
	Battery 2 Failure 02	H	Battery 2 Charge Failure
			Contact your service personnel.
	Battery 2 Failure 03	H	Battery 2 Aging
			Contact your service personnel.
	Battery 2 Failure 04	H	Battery 2 Comm Error
			Contact your service personnel.
	Battery 2 Failure 05	H	Battery 2 Failure
			Contact your service personnel.
	Battery Temp. High. Connect Ext.Pwr.	M	Battery temperature is a bit high during discharge.
			Connect to the external power supply.
	Battery Temp High. Syst maybe Down	H	Battery temperature is too high during discharge. The system may be down.
			Connect to the external power supply.
	Battery in Use	L	The current system is powered by battery. Connect to the external power supply.
			Connect to the external power supply.
	Low Battery. Connect Ext. Power.	M	The remaining battery power is lower than a threshold.
			Connect to the external power supply.
	System DOWN. Connect Ext. Power.	H	Battery power is depleted. The system will shut down in a few minutes.
			Connect to the external power supply immediately.
	Power Board Comm Stop	H	Power board communication stops.
			Contact your service personnel.

	Battery Undetected	H	Battery is not available in the current system. Contact your service personnel.
Main control board	Please Reset Date and Time	L	Button cell is available in the system. But the clock is powered down and reset. Re-set the date and time.
	Apnea Ventilation Ended	L	This alarm is given when apnea ventilation ends. There is no need to process this alarm.
	Key Error	L	Hardkey or rotary encoder is depressed continuously for more than 35s. Contact your service personnel.
	Technical Error 01	M	Keyboard Comm Stop. Keys are faulty. Contact your service personnel.
	Technical Error 02	M	Keyboard Selftest Error. Contact your service personnel.
	Device Failure 04	H	Ctrl Module Init Error. Contact your service personnel.
	Device Failure 05	H	Ctrl Module Comm Stop. Contact your service personnel.
	Device Failure 19	H	Power Board Comm Stop. Contact your service personnel.
	Device Failure 20	H	SpO_2 Comm Stop. Restart the ventilator or contact your service personnel.
	Device Failure 21	H	Pressure Sensor Zero Point Error. Contact your service personnel.
Monitor board	Technical Error 03	M	Turbine blower Temp Sensor Failure. Contact your service personnel.
	Technical Error 04	M	Buzzer Failure. Contact your service personnel.
	Technical Error 05	M	Atmospheric Pressure Sensor Failure. Contact your service personnel.
	Technical Error 06	M	HEPA Pressure Sensor Failure. Contact your service personnel.
	Technical Error 07	M	3-way Valve Failure. Contact your service personnel.
	Technical Error 08	M	Nebulizer Valve Failure. Contact your service personnel.
	Technical Error 09	M	Insp. Temp Sensor Failure. Contact your service personnel.
	Device Failure 01	H	Power Supply Voltage Error. Contact your service personnel.
	Device Failure 02	H	Memory Error. Contact your service personnel.

	Device Failure 03	H	Power Board Selftest Error. Contact your service personnel.
	Device Failure 06	H	Ctrl Module Selftest Error. Contact your service personnel.
	Device Failure 07	H	Insp. Module Comm stop. Contact your service personnel.
	Device Failure 08	H	Exp. Module Comm stop. Contact your service personnel.
	Device Failure 09	H	Pressure Sensor Failure. Contact your service personnel.
	Device Failure 10	H	Safety Valve Failure. Contact your service personnel.
	Device Failure 12	H	Insp. Limb Failure. Contact your service personnel.
	Device Failure 13	H	O_2 Limb Failure. Contact your service personnel.
	Device Failure 14	H	Turbine blower Failure. Contact your service personnel.
	Device Failure 15	H	Turbine blower Temp Too High. Contact your service personnel.
	Device Failure 16	H	Insp. Valve Disconnected. Contact your service personnel.
	Device Failure 17	H	Insp. Module Selftest Error. Contact your service personnel.
	Device Failure 18	H	Exp. Module Selftest Error. Contact your service personnel.
	Device Failure 21	H	Pressure Sensor Zero Point Error. Contact your service personnel.
	PEEP Too High	H	Monitored PEEP exceeds PEEP+5 cmH_2O (PEEP+10 cmH_2O for APRV mode) within any fully mechanical ventilation cycle. 1. Check the ventilation parameter setup. 2. Check the patient tubing for occlusion.
	PEEP Too Low	M	Patient's PEEP is less than the setting value to a certain extent. 1. Check the patient tubing for leakage. 2. Perform System Check to test the leakage.
	Airway Obstructed?	H	Tube is occluded. 1. Check and clean the patient tubing. 2. Check and clean the expiration valve.
	Sustained Airway Pressure	H	The airway pressure measured by any pressure sensor is greater than or equal to the setting PEEP+15 cmH_2O for continuous 15 s.

			1. Check the patient. 2. Check the ventilation parameter setup. 3. Check the patient tubing for occlusion.
	Airway Leak?	L	Tube is leaky.
			1. Check the patient tubing for leakage. 2. Perform System Check to test the leakage
	Tube Disconnected?	H	Tube is disconnected.
			Re-connect the patient tubing.
	Insp. Limb Airway Obstructed?	M	The patient tubing is bent or occluded in case of O_2 therapy.
			Check if the patient tubing is occluded or bent. If yes, clear it.
	Pressure Limited	L	In volume mode or pressure mode when ATRC function is enabled, the pressure reaches Paw high alarm limit-5.
			1. Check the patient. 2. Check the ventilation parameter setup. 3. Check pressure high alarm limit.
	Volume Limited	L	In pressure mode, delivered gas volume exceeds the set TV high limit.
			1. Check the patient. 2. Check the ventilation parameter setup. 3. Check the alarm limits.
	Pinsp Not Achieved	L	Pinsp is less than the pressure setting value by 3 cmH_2O or 1/3 of the pressure setting value, whichever is less.
			1. Check the patient. 2. Check TV alarm limits. 3. Check the O_2 supply. 4. Check the patient tubing for leakage. 5. Check the HEPA filter for occlusion.
	TV Not Achieved	L	TVi is less than the TV setting value for a period time.
			1. Check the patient. 2. Check pressure high alarm limit. 3. Check the HEPA filter for occlusion. 4. Check the O_2 supply. 5. Check the patient tubing for leakage or occlusion.
	Pressure Limited in Sigh cycle	L	The pressure reaches Paw high alarm limit-5 in sigh cycle.
			1. Check the patient. 2. Check pressure high alarm limit. 3. Check the patient tubing for occlusion. 4. Consider to turn off sigh.
	O_2 Supply Failure	H	O_2 pressure is low or high-pressure O_2 is not connected.

			1. Check connection with O_2 supply. 2. Check O_2 supply pressure.
	Tinsp Too Long	L	In PSV mode, Tinsp exceeds 4s for adult and 1.5s for pediatric for continuous 3 cycles. This alarm is not triggered again after pressure sensor or flow sensor failure.
			1. Check the patient. 2. Check the ventilation parameter setup. 3. Check the patient tubing for leakage.
	Please Check Exp. Flow Sensor	H	Installing the expiratory flow sensor fails.
			Contact your service personnel.
	Insp. Gas Temp Too High	H	The gas temperature exceeds 45℃. Restart the machine.
			1. Disconnect the patient. 2.Clean the fan dust filter. 3. Restart the ventilator.
	Replace HEPA Filter	L	The resistance of HEPA becomes intense.
			Contact your service personnel.
	Fan Failure	M	Fan speed error. Restart the machine if the error cannot be corrected.
			Contact your service personnel.
	Flow Sensor Type Error	H	Installation error of Air flow sensor or O_2 flow sensor.
			Contact your service personnel.
	Blower Temperature High	H	Turbine blower temperature exceeds the threshold.
			1. Check if the operating ambient temperature of the machine exceeds the maximum operating temperature specified by the vendor. 2. Check if the fan inlet and outlet are occluded. If yes, clear the foreign substance and dust. 3. Check the rotation of the fan. If it runs abnormally (such as abnormal sound or rotation speed), replace the fan.
	AMV: Cannot Meet Target	L	Cannot meet established MV%
			1. Check the ventilation parameter setup. 2. Check the alarm limits setting.
	O_2 Sensor Unconnected	L	The O_2 sensor is not connected.
			Connect the O_2 sensor.
	Please Replace O_2 Sensor.	M	The O_2 sensor is used up.
			Replace the O_2 sensor.
	Please calibrate O_2 sensor.	L	Calibrate the O_2 sensor.
			Calibrate O_2 concentration.
	Please perform pressure calibration.	H	Calibrate the pressure sensor.
			Contact your service personnel.
	Please perform flow	H	Calibrate the flow sensor.